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Supramolecular architecture of polymers as the basis of obtaining mesoporous polymers

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Abstract

Self-organization and arrangement of supramolecular structures from blockcopolymers are some of the ways used for the development of nanoporous and mesoporous polymers. Herein, reactive olygomers can play the key role in the design of supramolecular arranging of polymers. Optically transparent mesoporuos block-copolymers with adjusted free volume are obtained by the polyaddition of 2,4-toluene diisocyanate (TDI) to anionic macroinitiators. The mechanism of polyaddition of TDI to an anionic macroinitiator in various chemical solvents was studied by infrared spectroscopy. It is established that the reaction of forming polyisocyanate blocks of acetal nature (O-polyisocyanate) and stabilization of end O-polyisocyanate chains are based on the formation of voids in polymer. The formation of voids is conditioned by the geometry of self-organization of block-copolymers containing end potassium-O-polyisocyanates stabilized by crown ether fragments. The formation of urea with the participation of isocyanate groups of ortho-location of TDI is one of the main factors of the stabilization of O-polyisocyanate blocks. The investigation of the polymer sorption properties was carried out by electron spectroscopy. As an adsorbed dye Rhodamine 6G was used. The ability of Rhodamine 6G to sorb depended on the content of the O-polyisocyanate component in the polymer. Mesoporous polymers demonstrated high efficiency as an optically transparent matrix for laser-active media with high radiation stability. Rhodamine 6G in mesoporous polymers retains spectral luminescent properties and generates laser radiation during excitation by the second harmonic of Nd:YAG laser. © 2014 Taylor & Francis.

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Keywords

2 4-toluene diisocyanate, Anionic macroinitiators, Dye doped polymer, Infrared spectroscopy, Laser-active media, Mesoporous polymers, Polyisocyanates